

### **What is claimed is:**

**[Claim 1]** A process for producing a polymer-coated pigment particle, which process comprises:

- (a) reacting the particle with a reagent having a functional group capable of reacting with, and bonding to, the particle, and also having a polymerizable or polymerization-initiating group, thereby causing the functional group to react with the particle surface and attach the polymerizable group thereto; and
- (b) reacting the product of step (a) with at least one monomer or oligomer under conditions effective to cause reaction between the polymerizable or polymerization-initiating group on the particle and the at least one monomer or oligomer, thereby causing the formation of polymer bonded to the particle.

**[Claim 2]** A process according to claim 1 wherein, in step (a) the polymerizable group is bonded to the particle surface via an ionic bond.

**[Claim 3]** A process according to claim 2 wherein the bifunctional reagent used in step (a) comprises a silane coupling group.

**[Claim 4]** A process according to claim 2 wherein the bifunctional reagent used in step (a) comprises a trialkoxysilane coupling group.

**[Claim 5]** A process according to claim 2 wherein step (a) comprises:

- (a1) reacting the particle with a reagent having a first functional group capable of reacting with, and bonding to, the particle and a second functional group capable of reacting to form an ionic bond, thereby causing the first functional group to react with the particle surface and attach the second functional group thereto; and
- (a2) reacting the product of step (a1) with a second reagent having a polymerizable group and a third functional group capable of reacting with the second functional group to form the ionic bond, thereby causing the second and third functional groups to react together to form the ionic

bond, and thereby attaching the polymerizable group to the particle surface via this ionic bond.

[Claim 6] A process according to claim 5 wherein the second and third functional groups comprise an acidic and a basic group.

[Claim 7] A process according to claim 6 wherein the second and third functional groups comprise an ammonium group and a sulfonic acid group.

[Claim 8] A process according to claim 1 wherein, in step (a) the polymerizable group is bonded to the particle surface via a covalent bond.

[Claim 9] A process according to claim 8 wherein the reagent used in step (a) comprises a silane coupling group and an ethylenically unsaturated group.

[Claim 10] A process according to claim 9 wherein the reagent used in step (a) comprises a trialkoxysilane coupling group.

[Claim 11] A process according to claim 1 wherein, in step (a) there is attached to the pigment particle a group which provides an initiating site for atom transfer radical polymerization, and in step (b) the product of step (a) is treated with an atom transfer radical polymerizable monomer to form the polymer.

[Claim 12] A process according to claim 11 wherein the initiating site comprises a benzylic halogen atom.

[Claim 13] A process according to claim 11 wherein step (b) is carried out by treating the product of step (a) with a first atom transfer radical polymerizable monomer under conditions effective to cause polymerization of this monomer on to the particle, stopping this first polymerization, and thereafter treating the particle with a second atom transfer radical polymerizable monomer under conditions effective to cause polymerization of this monomer on to the particle, thereby forming a block copolymer of the two monomers on the particle.

[Claim 14] A process according to claim 1 wherein, in step (a) a polymerizable group is attached to the particle, and in step (b) the product of step (a) is contacted with at least one monomer or oligomer under conditions

effective to cause polymerization of the monomer or oligomer with the polymerizable group on the polymer, thereby causing formation of the polymer on the particle.

[Claim 15] A process according to claim 14 wherein the at least one monomer or oligomer used in step (b) comprises at least one monomer or oligomer having a chain of at least about four carbon atoms attached to a polymerizable group, where by the polymer formed on the particles comprises a main chain and a plurality of side chains extending from the main chain, each of the side chains comprising at least about four carbon atoms.

[Claim 16] A process according to claim 14 wherein the at least one monomer or oligomer used in step (b) comprises at least one monomer or oligomer comprising a group capable of initiating polymerization but which essentially does not initiate such polymerization under the conditions used in step (b), and following step (b) the polymer-bearing particle is contacted with at least one monomer or oligomer under conditions which cause the group capable of initiating polymerization to initiate polymerization of the at least one monomer or oligomer, thereby causing the formation of a branched-chain polymer on the particle.

[Claim 17] A process according to claim 16 wherein the group capable of initiating polymerization is a group capable of initiating atom transfer radical polymerization.

[Claim 18] A process according to claim 16 wherein the group capable of initiating polymerization is a group capable of initiating stable free radical polymerization.

[Claim 19] A process according to claim 1 further comprising depositing at least one of silica and alumina on the pigment particle prior to step (a).

[Claim 20] A process according to claim 19 wherein silica is deposited on the particle prior to step (a), the deposition being effected such that substantially the entire surface of the pigment particle is covered by the silica.

**[Claim 21]** A process according to claim 1 further comprising dispersing the polymer-coated pigment particle into a suspending fluid to form an electrophoretic medium.

**[Claim 22]** A process for coating a pigment particles with silica, the process comprising:

dispersing the pigment particles in a solution of a soluble silicate at a pH above about 8 and a temperature above about 60°C;  
adding to the dispersion of the pigment particles both a solution of an acid and a solution of a soluble silicate while maintaining the temperature of the dispersion above about 60°C, thereby causing deposition of silica on to the particles; and  
lowering the pH of the dispersion below about 4, and thereafter separating the silica-coated particles from the liquid.

**[Claim 23]** A process according to claim 22 wherein the dispersion of the pigment particles is maintained at a temperature in the range of about 80 to about 100°C as the solution of the acid and the solution of the soluble silicate are added thereto.

**[Claim 24]** A process according to claim 22 wherein the soluble silicate is sodium silicate.

**[Claim 25]** A process according to claim 22 wherein the acid is sulfuric acid.

**[Claim 26]** A process according to claim 22 wherein the reaction mixture is maintained substantially free from aluminum.

**[Claim 27]** A process according to claim 22 further comprising redispersing the separated silica-coated particles in an aqueous alcohol.

**[Claim 28]** An electrophoretic display comprising:

a) an arrangement of microscopic containers, wherein each container comprises a dielectric fluid and a suspension of particles having attached at least one organic group, wherein said organic group includes at least one ionic group, ionizable group, or both, wherein said fluid and said particles contrast visually;

- b) first and second electrodes wherein said arrangement is located between said electrodes and wherein at least one of the electrodes is substantially visually transparent; and
- c) means for creating a potential difference between the two electrodes, wherein said potential difference causes said particles to migrate towards one of the electrodes.

**[Claim 29]** A non-emissive display system comprising:

- a) at least one display element located between two electrodes wherein the display element is visually responsive to a potential difference between the electrodes; and
- b) a display piezoelectric element connected to the electrodes wherein deformation of the piezoelectric element produces the potential difference;

wherein said display element comprises an arrangement of microscopic containers, wherein each container comprises a dielectric fluid and a suspension of particles having attached at least one organic group, wherein said organic group includes at least one ionic, ionizable group, or both, wherein said fluid and said particles contrast visually.